

Fan et al.

5           PERSONAL CLEANSING COMPOSITIONS THAT CONTAIN  
SURFACTANTS, CO-SURFACTANTS, WATER INSOLUBLE SOLIDS  
AND/OR LIQUIDS AND CATIONIC CONDITIONING POLYMERS

10                           BACKGROUND OF THE INVENTION

15           Many cosmetic compositions are also cleansing compositions and thus have a  
surfactant base. Thus, there is a need for surfactant based systems from which  
cosmetically active ingredients can be efficiently deposited onto skin or hair. Many  
current surfactant based systems do not allow for such deposition.

20           There is also a need for this deposition across a whole range of cosmetic  
compositions which include hair shampoos, hair conditioners, sunscreens, deodorants,  
antiperspirants, insect repellants, lipsticks, lip balms, mousses, skin moisturizing  
compositions, anti-wrinkling compositions, antibacterial compositions, anti-fungal  
compositions, topical anesthetics; skin rash, skin disease, and dermatitis medications;  
25           anti-itch compositions, acne treatment preparations, burn relief medications, sunburn  
relief medications; medications for the relief of seborrhea, psoriasis, and dandruff; skin  
cleansing compositions, and compositions for relief from insect bites.

30           The present invention provides such surfactant bases and cosmetic  
compositions.

Publications, which relate to the invention are as follows:

WO 9517880 discloses mild, high lathering shampoo compositions with high deposition of functional materials, the shampoo compositions comprising (a) from about 5% to about 40% by weight surfactant system (i) from 80% to 99% by weight of the surfactant system, anionic surfactants which are alkyl ethoxylated sulfates and alkyl sulfates in a ratio between about 1:1 to about 1:0 and (ii) about 1% to about 20% by weight of the surfactant system, polyhydroxy fatty acid amide surfactants; 0.05% functional materials; 35% to about 95% water;

WO 9217154 discloses hair conditioning compositions containing a deterative surfactant component, a silicone hair conditioning agent, water and preferably a suspending agent for the silicone conditioning agent. The deterative surfactant component comprises at least in part polyethylene glycol/glycerol fatty ester nonionic surfactant.

RU 2129860 C1 discloses a shading shampoo which contains surface active substances including nonionizing and ionogenic substances, anionic substances, softening components, color, flavor, water. Nonionizing substances additionally have ethoxymonoethanolamide of synthetic fat acids of fraction C10-C16 -syntamide-5. Glycerine or carbamine is used as a softening component. Shampoo additionally has carboxymethylcellulose and formalin. The components are taken in determined ratio.

## SUMMARY OF THE INVENTION

The present invention relates to rinse-off cleansing compositions, especially cleansing compositions containing conditioning oils and cationic conditioning polymers. Examples of such compositions are conditioning shampoos for cleaning and conditioning hair, and body washes for cleaning and conditioning skin.

When washing hair or skin with conventional, non-conditioning cleansing compositions the natural oils are removed together with unwanted oils and dirt. When

excessive amounts of natural oils are removed, especially due to frequent washing, the hair or skin becomes dry. Such dryness causes hair to become raspy, less easy to comb and to build-up static that results in "flyaway". In the case of skin, the dryness results in enhanced removal of moisture and, subsequently, cracking of the skin.

5

Hair and skin conditioners have been developed in order to restore the condition of the hair or skin, from the damage caused by washing, to its pre-washed or normal state. However, use of such products involves expensive and time-consuming additional steps.

10

Non-volatile silicone conditioning oils can be efficiently deposited onto skin and hair by directly incorporating them into the cleansing composition which is generally a mixture of anionic and nonionic/ amphoteric deterative surfactants. This process usually results in production of dispersions of silicone oils with a particle sizes of greater than 2  $\mu\text{m}$ . Such large particles of silicone and hydrocarbon oils have a detrimental influence on the lathering characteristics of the cleansing composition due to 'anti-foam' effect.

15

Incorporation of silicone oil as a preformed aqueous emulsion into the cleansing composition enables attainment of particle size of less than 2  $\mu\text{m}$  that has minimal effect on the lathering characteristics of the cleansing composition. Incorporation of silicone oils as a preformed emulsion also renders manufacturing of the compositions easier than when they are directly added into the composition. However, the efficiency of deposition on hair or skin of such small particles of silicone or hydrocarbon oils is generally very poor and the cleansing compositions containing dispersions of such small particles of silicone or hydrocarbon oils provide minimal or no conditioning.

20

25

Reid and Murray (US 5,085,857) have disclosed cleansing compositions comprising a combination of a particular type of cationic conditioning polymer (guar hydroxypropyl trimethyl ammonium chloride) and an aqueous emulsion of non-volatile silicone oils of particle size less than 2  $\mu\text{m}$ . These compositions impart improved

30

conditioning benefit to hair with none of the undesirable dulling effects or greasy build-up seen with other conditioning products, and without a need for an expensive and inconvenient two-step washing and conditioning process. These compositions produce a creamy, copious lather.

We, unexpectedly, have found that by using a specific type of nonionic surfactant, namely alkoxyated nonionic surfactants, along with anionic surfactants, cationic polymer and silicone emulsions, high levels of silicone deposition, and hence conditioning, can be achieved. Additionally, we found that the efficiency of silicone deposition goes through a maximum at an optimum level of alkoxylation of the surfactant mixture. The optimum number of alkoxylation may depend on the specific surfactant mixture.

Compositions of the invention may comprise a mixture of:

- a) from about 2 to about 40% by weight of a surfactant selected from the group consisting of anionic, amphoteric, non-ionic surfactants, and mixtures thereof;
- b) from about 0.01 to about 20% by weight of a co-surfactant which is an alkoxyated nonionic surfactant;
- c) from about 0.001 to about 10% by weight of a cationic polymer ; and
- d) from about 0.01 to about 30% by weight of water insoluble components with an average particle size of less than about 2 $\mu$ m.

wherein dilution with water, of a), b), and c) in a premixture, at a ratio of premixture:water at about 1:10 forms a turbid mixture.

The invention also comprises a method of treating the hair and/or skin which involves contacting the hair and/or skin with a composition of the invention.

## DETAILED DESCRIPTION OF THE INVENTION

5 As used herein % means weight % of the total composition unless otherwise specified. Degrees are in degrees Celsius unless otherwise specified. As used herein "turbid" means that a dilution of a premixture of a, b, and c above, (that is, in the absence of d) -- 'water insoluble components') with water at a ratio of premixture:water at about 1:10 measures at least about 3 NTU using the following protocol.

10 Turbidity protocol:

a) Background turbidity (Tb)

15 Fill the sample cell (Hach reference:20849-00) with said premixture in the absence of 'water insoluble components' and leave it standing for 24 hours to release any trapped air. Turbidity (NTU) is then measured on a Hach RATIO/XR with the measurement being taken at 5 minutes after inserting the sample cell into the turbidity meter.

20 b) Dilution turbidity (Td)

25 3g of said premixture above, in the absence of 'water insoluble components', and 27g of soft water are added in a sample cell (Hach reference: 20849-00). The mixture is immediately mixed vigorously using a magnetic stirrer for 30 seconds and then sonicated for 1 minute (Sonicator used: BRANSON 1210). The sample cell is inserted into a turbidity meter (Hach RATIO/XR turbidmeter) immediately and the dilution turbidity measurement, Td (NTU), is taken at 5 minutes after insertion of the sample cell into the Hach RATIO/XR.

30 c) The turbidity value (in NTU units) quoted in this application is calculated as  $Td - 1/10Tb$ .

Another embodiment of the invention is a composition comprising a mixture of:

- a) from about 2 to about 40% by weight of a surfactant selected from the group consisting of anionic, amphoteric, non-ionic surfactants, and mixtures thereof;
- b) from about 0.01 to about 20% by weight of a co-surfactant which is alkoxyated nonionic surfactant, the alkoxyated nonionic surfactant not being an ethoxyated fatty alcohol containing 6 to 30 ethylene oxide groups;
- c) from about 0.001 to about 10% by weight of a cationic polymer ; and
- d) from about 0.01 to about 30% by weight of water insoluble components with an average particle size of less than about 2 $\mu$ m.

More preferably, compositions of the invention comprise a mixture of:

- a) from about 5 to about 25% by weight of surfactant selected from the group consisting of anionic, amphoteric, non-ionic surfactants, and mixtures thereof;
- b) from about 0.05 to about 10% by weight of a co-surfactant which is alkoxyated nonionic surfactant;
- c) from about 0.01 to about 1% by weight of a cationic polymer ; and
- d) from about 0.05 to about 10% by weight of water insoluble components with an average particle size of less than 2 $\mu$ m.

What follows is a description of the ingredients which may be used in the compositions of the invention.

## Surfactants

The compositions according to the invention comprise a surfactant selected from the group consisting of anionic, nonionic, amphoteric surfactants, and mixtures thereof.

Nonlimiting, suitable anionic surfactants are the alkyl sulfates, alkyl ether sulfates, alkaryl sulfonates, alkaryl isethionates, alkyl succinate, alkyl sulfosuccinates, N-alkoyl sarcosinates, alkyl phosphates, alkyl ether phosphates, alkyl ether carboxylates, and alpha-olefin sulfonates, especially their sodium, magnesium, ammonium and mono-, di- and triethanolamine salts. The alkyl and acyl groups generally contain from 8 to 18 carbon atoms and may be saturated and/or unsaturated. The alkyl ether sulfates, alkyl ether phosphates and alkyl ether carboxylates may contain from 1 to 10 ethylene oxide or propylene oxide units per molecule, and preferably contain 1 to 3 ethylene oxide units per molecule. Other nonlimiting and suitable anionic surfactants include sodium oleyl succinate, ammonium lauryl sulfosuccinate, ammonium lauryl sulfate, sodium dodecylbenzene sulfonate, triethanolamine dodecylbenzene sulfonate, sodium cocoyl isethionate, sodium lauroyl isethionate and sodium N-lauryl sarcosinate. The most preferred anionic surfactants are sodium lauryl sulfate [SLS], ammonium lauryl sulfate [ALS], sodium lauryl ether sulfate with 1 EO, 2EO and 3EO [SL(EO)<sub>1-3</sub>S] and ammonium lauryl ether sulfate with 1 EO, 2EO and 3EO [AL(EO)<sub>1-3</sub>S].

The nonionic surfactants suitable for use in the compositions of the invention may have less than about 2 EO and may include condensation products of aliphatic (C<sub>8</sub> - C<sub>18</sub>) primary or secondary linear or branched chain alcohols, phenols, esters, acids and amines. Other suitable nonionics include mono or dialkyl alkanolamides or alkyl polyglucosides. Nonlimiting examples of nonionic surfactants include coco mono or diethanolamide, coco mono isopropanolamide, and coco di glucoside.

The amphoteric surfactants suitable for use in the compositions of the invention may include alkyl amine oxides, alkyl betaines, alkyl amidopropyl betaines, alkyl

sulfobetaines, alkyl glycines, alkyl carboxy glycines, alkyl amphoteric propionates, alkyl amidopropyl hydroxysulfates, acyl taurates and acyl glutamates wherein the alkyl and the acyl groups have from 8 to 18 carbon atoms. Examples include lauryl amine oxide, cocodimethyl sulfopropyl betaine and preferably lauryl betaine, cocamidopropyl betaine (CAPB) and sodium cocamphopropionate.

The surfactants may be present in the range from about 2 to about 40% by weight, preferably about 5 to about 30% by weight and more preferably from about 8 to about 20% by weight and most preferably from about 10 to about 15% by weight.

#### Co-surfactants

For the purpose of this invention, alkoxyated nonionic surfactants, which are a class of nonionic surfactants, are defined specifically as co-surfactants. Again, for the purpose of this invention only, alkoxyated nonionic surfactants, which are co-surfactants, are differentiated from the other nonionic surfactants defined previously, in that alkoxyated nonionic surfactants, which are co-surfactants, contain at least 2 or more alkylene oxide groups. (By contrast, nonionic surfactants with EO less than 2 are considered to be surfactants as described in the paragraphs above.) Examples of alkoxyated nonionic surfactants include, but are not limited to, condensation products of linear or branched fatty chain alcohols, acids, phenols, esters, glycerides, amines and amides. The preferred co-surfactants are ethoxylated nonionic surfactants with ethylene oxide (EO) groups in the range of 2 -12 and most preferably from 2 to 6. Especially preferred nonionic surfactants are ethoxylated fatty amides with the (EO) groups in the range of 2-12, most preferably 2 to 6.

The co-surfactants are present preferably in the range of 0.05 to 20% by weight, more preferably from 0.1 to 10% by weight and most preferably from 0.2 to 5% by weight.



## Cationic polymer

5 Nonlimiting, cationic polymers that can be used in compositions of the invention include cationic cellulose derivatives, cationic starches, copolymers of a dialkyl quaternary ammonium salt and acrylamide, quaternized polyvinylpyrrolidone, quaternized vinylpyrrolidone vinylimidazol polymers, polyglycol amide condensates, quaternized collagen polypeptide, polyethylene amine, cationized silicon polymer, cationic silicone polymers, copolymers of adipic acid and dimethylamino- hydroxypropyl diethylene triamine, polyaminopolyamide and their water soluble crosslinked polymers, cationic chitin derivatives, and cationic guar gums. The preferred cationic conditioning polymer is a cationic derivative of guar gum. The most preferred cationic polymer is guar hydroxy propyl trimethyl ammonium chloride.

15 The cationic polymers are preferably present in the range from 0.001 to 10% by weight, more preferably from 0.01 to 1% by weight and most preferably from 0.05 to 0.5% by weight.

## Water insoluble components

25 Water insoluble components that can be used in compositions of the invention include, but are not limited to, particulate materials such as oil droplets, silica and polymeric latex particles. The oil phase can comprise a volatile oil phase, a nonvolatile oil phase or a mixture thereof. The volatile oil phase can comprise a volatile silicone compound, a volatile hydrocarbon compound or a mixture thereof. Preferably, the volatile oil phase comprises a volatile silicone compound. Exemplary volatile compounds are listed in US Patent 5,589,177 which is hereby incorporated by reference.

The cyclic, low molecular weight, volatile polydimethylsiloxanes, designated in the CTFA International Cosmetic Ingredient Dictionary, 4th Ed., Cosmetic, Toiletry and Fragrance Association, Washington, D.C. (1991) (hereinafter CTFA Dictionary which is hereby incorporated by reference). as cyclomethicones, are the preferred siloxanes used in compositions of the present invention and are listed in US Patent 5,589,177.

The volatile oil phase also can comprise a volatile hydrocarbon compound. Volatile hydrocarbon compounds are listed in US Patent 5,589,177. The volatile hydrocarbon compounds perform the same function and provide essentially the same benefits as the volatile silicone compounds.

As previously stated, the oil phase also can be a nonvolatile oil phase. The nonvolatile oil phase comprises a nonvolatile silicone compound, a nonvolatile hydrocarbon, or a mixture thereof. Preferably, the nonvolatile oil phase comprises a nonvolatile silicone compound. The nonvolatile oil phase does not evaporate from the skin or hair. The nonvolatile oil phase boils at atmospheric pressure at a temperature above about 250 degree(s) C. Exemplary nonvolatile silicone compounds are listed in US Patent 5,085,857 which is incorporated herein by reference.

The nonvolatile oil phase can also comprise a nonvolatile hydrocarbon compound, such as mineral oil. Other exemplary nonvolatile hydrocarbon compounds that can be incorporated into the oil phase include, but are not limited to, a branched 1-decene oligomer, like 1-decene dimer or a polydecene. The oil phase also optionally can comprise (1) an oil, such as jojoba oil, wheat germ oil or purcellin oil; or (2) a water-insoluble emollient, such as, for example, an ester having at least about 10 carbon atoms, and preferably about 10 to about 32 carbon atoms. Suitable esters are listed in US Patent 5,589,177.

Water insoluble components can also include materials such as hair fixatives, hydrophilic particles, conditioning materials, emulsion particles, wax particles, encaps, dye/color particles, anti-dandruff particles and mixtures thereof.

Water insoluble components can further include materials used in sunscreens, deodorants, antiperspirants, insect repellants, lipsticks, lip balms, mousses, skin moisturizing compositions, anti-wrinkling /anti-aging compositions, antibacterial compositions, antifungal compositions, topical anesthetics, skin rash, skin disease, and dermatitis medications, anti-itch compositions, acne treatment preparations, burn relief medications, sunburn relief medications, medications for the relief of seborrhea, psoriasis, and dandruff, skin cleansing compositions, and compositions for relief from insect bites.

For the purpose of this invention, water insoluble components are defined as materials, which have solubility in water not greater than about 0.01g/l when measured at about 25<sup>0</sup>C in a pH range between about 3.5 and about 8.

Water insoluble particulates are present in the range from about 0.01 to about 30% by weight, preferably from about 0.05 to about 20% by weight, more preferably from about 0.1 to about 10% by weight and most preferably from about 0.5 to about 5% by weight.

#### Optional Ingredients

Optional ingredients that can be used in compositions of the invention are now described.

Optional ingredients can include any ingredients which are customarily included in cosmetic products and which do not interfere with the deposition properties of the surfactant system.

As optional components for inclusion in the compositions of the invention, the following may be mentioned: pH adjusting agents, suspending agents and viscosity modifiers such as xanthan gum and cross-linked polycarboxylates, cosmetic fillers such as talc, kaolin, preservatives, coloring agents, dyes, proteins, herb and plant extracts, polyols and moisturizing ingredients such as glycerine. Benefit agents that can be incorporated include, but are not limited to, sunscreens and alpha hydroxy acids.

Compositions of the invention can be made by using starting materials that are known in the art or by using starting materials that are obtainable from materials known in the art.

The following examples are provided for the purpose of illustration only, and do not, in any way, limit the scope of the invention.

## Example 1 (Hair Care Compositions)

Ingredient		wt%									
Formula # →	1	2	3	4	5	6	7	8	9	10	
ALS	12.0	12.0	12.0	12.0							
AL(EO) <sub>1</sub> S					12.0	12.0	12.0				
AL(EO) <sub>2</sub> S								12.0	12.0	12.0	
CMEA	1.80				1.80			1.80			
CM(EO) <sub>2</sub> A		1.80				1.80			1.80		
CM(EO) <sub>3.5</sub> A			1.80								
CM(EO) <sub>4.5</sub> A				1.80			1.80			1.80	
NH <sub>4</sub> Cl	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Jaguar C13S	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
DC 1784	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
Propylene glycol	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
DI Water	to 100	to 100	to 100	to 100	to 100	to 100	to 100	to 100	to 100	to 100	
Si on hair, ppm*	30	130	230	580	145	190	400	190	190	260	

This example shows that for a given number of ethylene oxide groups in ammonium lauryl sulfate, an increase in the number of ethylene oxide groups in cocomonoethanolamide results generally in an increased silicone deposition.

5

Jaguar C13S - Guar hydroxypropyl trimethyl ammonium chloride from Rhodia Inc., USA

DC 1784 - Dimethiconol emulsion from Dow Corning Inc., USA

CMEA - Cocomonoethanolamide

10

CM(EO)<sub>x</sub>A - Ethoxylated cocomonoethanolamide

x - The number of ethylene oxide groups.

Superscript \* - Silicone oil content measured as Si element by Inductively Coupled Plasma Spectrophotometer and are reported as micrograms dimethiconol per gram of hair.

15

## Example 2 (Hair Care Compositions)

Ingredient	wt%	
Formula #	11	12
Sodium lauryl sulfate, SLS	12.0	12.0
CMEA	1.80	
CM(EO) <sub>4.5</sub> A		1.80
Jaguar C13S	0.10	0.10
DC 1784	2.00	2.00
Propylene glycol	0.50	0.50
Deionized water	to 100	to 100
Si on hair, ppm	290	615

This example shows that in systems containing sodium lauryl sulfate and CM(EO)<sub>4.5</sub>A results in significantly higher silicone deposition than when sodium lauryl sulfate and CMEA is used.

## Example 3 (Hair Care Compositions)

Ingredient	wt%		
Formula #	13	14	15
ALS	6.0	6.0	6.0
AL(EO) <sub>1</sub> S	6.0	6.0	6.0
Ammonium chloride	1.0	1.0	1.0
CMEA	1.8	1.2	0.9
CM(EO) <sub>5</sub> A	-	0.6	0.9
Jaguar C13S	0.1	0.1	0.1
DC 1784	2.0	2.0	2.0
Propylene glycol	0.5	0.5	0.5
Carbapol (thickening agent)	0.4	0.4	0.4
Mica & titanium dioxide (pearling agent)	0.1	0.1	0.1
Other minors (Fragrance, preservatives)	1.0	1.0	1.0
Deionized water	to 100	to 100	to 100
Si on hair, ppm	30	260	560

This example shows that in systems containing mixtures of ammonium lauryl sulfate [ALS], ethoxylated ammonium lauryl sulfate [AL(EO)<sub>1</sub>S], cocomonoeethanolamide [CMEA] and ethoxylated cocomonoeethanolamide [CM(EO)<sub>5</sub>A], an increase in [CM(EO)<sub>5</sub>A] content relative to cocomonoeethanolamide results in an increase in silicone deposition.



## Example 4 (Hair Care Compositions)

5	Ingredient	wt%
	Formula #	16                  17
	ALS	6.0                  6.0
10	AL(EO) <sub>1</sub> S	6.0                  6.0
	Ammonium chloride	1.0                  1.0
	CMEA	1.8                  1.2
	CM(EO) <sub>5</sub> A	-                    0.6
	Jaguar C13S	0.1                  0.1
15	JJ 555	2.0                  2.0
	Propylene glycol	0.5                  0.5
	Carbapol (thickening agent)	0.4                  0.4
	Ethylene glycol distearate (pearling agent)	0.1                  0.1
	Other minors (Fragrance, preservatives)	1.0                  1.0
20	Deionized water	to 100              to 100
	Si on hair, ppm	260                  445

Note : JJ 555 is a dimethiconol emulsion from GE Silicones, USA

This example shows that the general trend seen in Example 3 holds when a different dimethiconol emulsion other than DC1784 is used. The different dimethiconal emulsion used here is JJ 555.

On a laboratory bench scale, compositions of the invention are made by the following procedure:

For preparing a 1kg batch, 100 grams of soft water are weighed into a beaker provided with an overhead mixer. Desired amounts of anionic and nonionic-co-surfactants are then slowly added and the contents well mixed. If the non-ionic co-surfactant is in a solid form at ambient temperature, the batch is then heated to about 70-80 °C to ensure a good mixing and then cooled back to ambient temperature. Any loss of water is then made-up. A 2% Carbapol solution was subsequently added and mixed well, and this is followed by the addition of cationic guar dispersion in propylene glycol (1:5 guar/ PG). Non-volatile silicone emulsion, fragrances and other minor ingredients are then added to the mix. Salt solution and remainder of soft water are subsequently added to the contents.

#### Method of Use of Compositions of the Invention

Compositions of the invention may be used as hair shampoos by applying said compositions to wet hair, lathering, then rinsing. Hair conditioners may be used after shampooing with compositions of the invention on an as-needed basis.

Compositions of the invention may be used as body washes by wetting the body in the shower, and then applying a composition of the invention, and then rinsing with water.